

## Traffic Generation Example

The following Traffic Generation Example has been updated and is provided to give a better understanding of the methodology for creating the Traffic Generation Diagram.

Please note that DelDOT's [Development Coordination Portal](#) and the [Institute of Transportation Engineer's Trip Generation Manual and Handbook](#) provide worksheets and tools for determining various factors necessary to create a Trip Generation Diagram; however, these worksheets and tools are periodically updated and may cause inconsistencies with the examples below.

### Example Project – One Site Entrance:

A residential development is proposed on the easterly side of Autumn Moon Lane south of Walnut Shade Road in Kent County. The development consists of 52 single family detached units and 96 multifamily housing (low-rise). The site proposes one entrance along Autumn Moon Lane.

#### • Road Traffic Data:

1. Functional Classification and Roadway Maintenance Number – Information within the [DelDOT Gateway: K-369 Autumn Moon Lane – Local](#)
2. Posted Speed – Actual posted speed from the roadway – Google Street View: **50 MPH**
  - If roadway does not have a posted speed limit, can assume 50 MPH.
  - Speed limit resolution information is available within the [DelDOT Gateway](#), which should be verified with the Google Street View information.
3. AADT - Information from the latest [DelDOT Gateway: 1,501 Trips](#) (From 2022 DelDOT Traffic Summary)
4. 10-Year Projected AADT = Current ADT x 10-Year Growth Factor. Apply the same 10-Year Growth Factor that is used in DelDOT's [Auxiliary Lane Worksheet](#). Currently the growth factor is 1.16. The most up-to-date worksheet is located within DelDOT's [Development Coordination Portal](#):  
**10-year AADT = 1,501 x 1.16 = 1,741 Trips**
5. Traffic Pattern Group - Information from the [DelDOT Gateway: TPG – 4](#)
6. K-Factor, D-Factor, Truck Percentage – Information from the latest DelDOT [Traffic Volume Summary](#):  
**K-Factor = 12.4, D-Factor = 58.6, Combo Unit Truck % = 0.8** (From 2022 DelDOT Traffic Summary)

- **Site Traffic Data:**

1. Trip generation is based on the latest edition of the ITE Trip Generation Manual approved by DelDOT to utilize. Procedure to determine if rates and/or equations are to be used to calculate the trip generation for the proposed development is based on the guidance provided in the latest ITE Trip Generation Handbook.
  - i. 52 Single Family Detached Units (ITE Land Use Code 210) - Use equation which results in **553 ADT (276 Enter/277 Exit), 41 AM Peak (11 Enter/30 Exit), 54 PM Peak (34 Enter/20 Exit)**
  - ii. 96 Multifamily Housing (Low-Rise) (ITE Land Use Code 220) - Use equation which results in **691 ADT (345 Enter/346 Exit), 53 AM Peak (13 Enter/40 Exit), 62 PM Peak (39 Enter/23 Exit)**
2. Number of entrances and corresponding configurations: **One Entrance – Full Movement**
3. Design Vehicle – Select a design vehicle that is likely to use the proposed development entrances with considerable frequency and is consistent with Figure 5.2.3-a from the Development Coordination Manual. **SU-30**
4. Total Site Traffic for Proposed Development – **1,244 ADT (621 Enter/623 Exit), 94 AM Peak (24 Enter/70 Exit), 116 PM Peak (73 Enter/43 Exit)**
5. Directional Distribution: If information specific to the site occupant is available, for example, the feeder pattern for a school site, that information should be used. More commonly, this distribution is based on engineering judgment which is based upon existing and /or future traffic patterns surrounding the development area. Details of determining peak hour volumes are located in the **Traffic Generation Diagram** section below.

In this case **85% to and from the north and 15% to and from the south.**

  - **85% to and from the north = 1,244 x 85% = 1,058 ADT (528 Enter/530 Exit), 80 AM Peak (20 Enter/60 Exit), 99 PM Peak (62 Enter/37 Exit)**
  - **15% to and from the south = 1,244 x 15% = 186 ADT (93 Enter/93 Exit), 14 AM Peak (4 Enter/10 Exit), 17 PM Peak (11 Enter/6 Exit)**
6. Percent of Peak Hour Heavy Vehicles at Site - Select a percentage that is consistent with the proposed development – **Peak Hour HV% of Proposed Site = 5%.**

**Traffic Generation Diagram:**

1. Development generated trips should be assigned to the proposed entrances according to the actual development site plan as well as existing and/or future traffic patterns surrounding the development area.
2. For the purpose of this example, the directional distribution is 85% to and from the north and 15% to and from the south.
  - **Site ADT entering from the south = Entering ADT for Proposed Development x Percentage of Proposed Development from the south = 621 x 15% = 93.**
  - **Site ADT entering from the north = Entering ADT for Proposed Development x Percentage of Proposed Development from the north = 621 x 85% = 528.**
  - **Site ADT exiting to travel south = Exiting ADT for Proposed Development x Percentage of Proposed Development to south = 623 x 15% = 93.**
  - **Site ADT exiting to travel north = Exiting ADT for Proposed Development x Percentage of Proposed Development to north = 623 x 85% = 530.**

The same procedure should be done for the AM and PM peak hour site traffic.

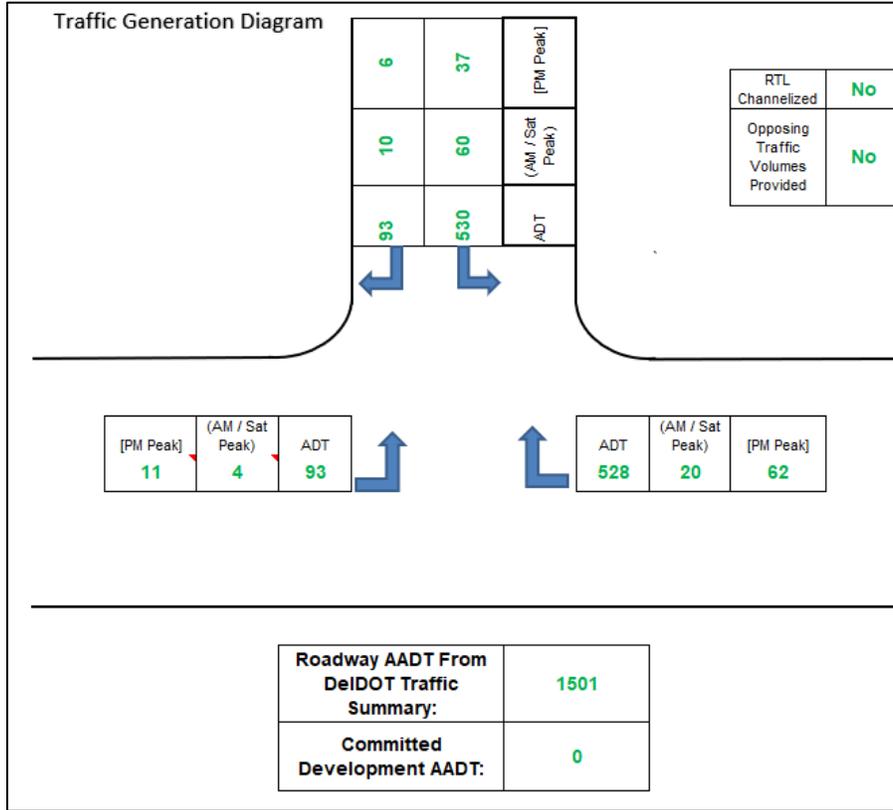
TRAFFIC GENERATION - AUTUMN MOON LANE (K369) (FULL MOVEMENT)	
<p style="text-align: center;">TRAFFIC GENERATION DIAGRAM ADT (A.M. PEAK HOUR) [P.M. PEAK HOUR] (DISTRIBUTION)</p>	<p><b>ROAD TRAFFIC DATA:</b>                      FUNCTIONAL CLASSIFICATION - K-369 (AUTUMN MOON LANE) - LOCAL                      POSTED SPEED LIMIT - 50 mph                      ROADWAY AADT = 1,501 TRIPS (FROM 2022 DeIDOT TRAFFIC SUMMARY)                      10 YEAR PROJECTED ROADWAY AADT = 1.16 X 1,501 TRIPS = 1,741 TRIPS                      TRAFFIC PATTERN GROUP - 4 (FROM 2022 DeIDOT TRAFFIC SUMMARY)                      K-FACTOR = 12.4, D-FACTOR = 58.6, COMBO UNIT TRUCK % = 0.8 (FROM 2022 DELDOT TRAFFIC SUMMARY)</p> <p><b>SITE TRAFFIC DATA:</b>                      SOURCE: ITE TRIP GENERATION MANUAL 11th EDITION.                      52 SINGLE FAMILY DETACHED UNITS (210)                      96 MULTIFAMILY HOUSING (LOW-RISE) (220)                      ONE ENTRANCE - FULL MOVEMENT                      DESIGN VEHICLE: SU-30                      52 SINGLE FAMILY DETACHED UNITS = 553 ADT (276 ENTER/277 EXIT),                      41 AM PK (11 ENTER/30 EXIT), 54 PM PK (34 ENTER/20 EXIT)                      96 MULTIFAMILY HOUSING (LOW RISE) UNITS = 691 ADT (345 ENTER/346 EXIT),                      53 AM PK (13 ENTER/40 EXIT), 62 PM PK (39 ENTER/23 EXIT)                      TOTAL SITE = 1,244 ADT (621 ENTER/623 EXIT), 94 AM PK (24 ENTER/70 EXIT),                      116 PM PK (73 ENTER/43 EXIT)                      DIRECTIONAL DISTRIBUTION                      85% TO AND FROM THE NORTH                      15% TO AND FROM THE SOUTH                      PEAK HOUR HV% OF PROPOSED SITE = 5%</p>

- **DelDOT Auxiliary Lane Worksheet**

Complete the worksheet per below:

1. Fill in the volumes on the **Traffic Generation Diagram** tab consistent with the Traffic Generation Diagram created for the Entrance Plan.
  - i. If the proposed entrance will create the fourth leg to an existing entrance, separate Auxiliary Lane Worksheets shall be completed and submitted for review of both the proposed entrance and the existing entrance.
  - ii. If the proposed entrance will create the fourth leg to an existing T intersection (2 roads), an Auxiliary Lane Worksheet shall be completed for the proposed entrance and all other approaches will need further evaluation per the Development Coordination Manual and associated state and federal manuals (i.e. AASHTO Green Book).
2. If the entrance is an existing access point, left turn and right turn ADT and peak hour volumes shall include site traffic and existing roadway traffic.
3. If opposing roadway traffic volumes were collected, include in the worksheet.
4. If the opposing right-turn movement is channelized, a reduction may be included in the worksheet. Justification for reduction shall be submitted to DelDOT Development Coordination Section for review.
5. If Committed Development traffic information is known, include in the worksheet. This information is commonly included in a Final TIS.
6. In the **User Inputs** tab, fill in the cells with green text.
  - i. If opposing roadway traffic volumes were collected and/or the opposing right- turn movement is channelized, the Left Turn VPH should be the same peak hour as the peak hour chosen for the opposing through and right turn volumes within the **Traffic Generation Diagram** tab.
7. To obtain further clarification on how ADT is determined per approach, see **Left-Right Approach Example** tab within the DelDOT Auxiliary Lane Worksheet.

# Creation of DeIDOT Auxiliary Lane Worksheet for Proposed Entrance



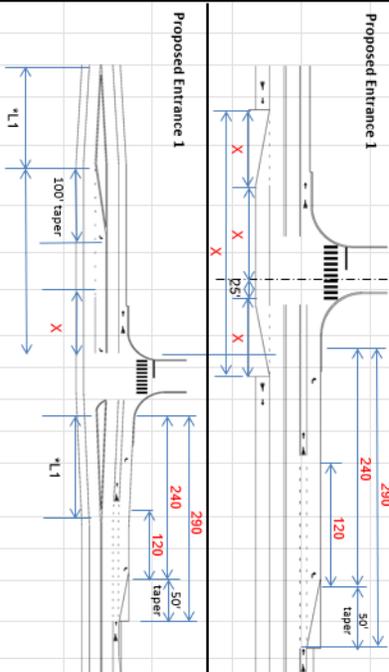
April 28, 2023
Y2020.3

## DeIDOT Auxiliary Lane Worksheet

Roadway Information and Entrance

Manually Update Cell	XX
Auto-Calculated Cells	XX

Name of Project		Example - 1 Access		Date of Submittal		5/5/2023	
Maintenance Road No. (i.e. K234A)		K369		Road Name		Autumn Moon Lane	
Signalized / Unsignalized		Unsignalized		Posted Speed Limit		50	
Roadway ADT (From DeIDOT Traffic Manual)		1501		Traffic Pattern Group		4	
Left Approach Site ADT	186	Committed Development ADT	0	Total Left Approach ADT	186	Right Approach Site ADT	1058
				Committed Development ADT	0	Total Right Approach ADT	1058
Total Number of Through Lanes (Does Not Include Turn Lanes)		2 lanes		Number of intersection legs		3	
Roadway Functional Classification		Local		Calculation for (specify leg)		Proposed Entrance 1	
Left-Approach Projected 10 yr Roadway ADT + Total Site + Committed Development ADT		1927		Right-Approach Projected 10 yr Roadway ADT + Total Site + Committed Development ADT		2799	
K Factor		12.4		D Factor		58.6	
<b>Left Turn Information</b>				<b>Right Turn Information</b>			
Left Turn VPH		11		Right Turn ADT		Over 400	
Left Turn Approach Grade		0.0%		Right Turn Approach Grade		0.0%	
Heavy Vehicle %		5		Effective Radius of Entrance		R≤50'	
10 Yr Opposing Vol. (Manual Input - Veh/hr)		0		Right Turn Length		290 ft	
10 Yr Opposing Volume (Calculated)		127 Veh/hr		Bypass and Left Turn Lanes are not required			
10 Yr Opposing Volume (Calculated Vol.)		127 Veh/hr					



Example - 1 Access

### Example Project – Two Site Entrances:

A mixed-use development is proposed on the southerly side of Old Coach Road between Upper Pike Creek Road and Polly Drummond Road in New Castle County. The development consists of a 5,000 square-foot drive-in bank, 10,000 square feet of retail, and 210 multifamily housing units (low-rise). The site proposes two entrances on Old Coach Road.

- **Road Traffic Data:**

Functional Classification and Roadway Maintenance Number – Information within the [DelDOT Gateway: N-316 Old Coach Road – Major Collector](#)

1. Posted Speed – Actual posted speed from the roadway – Google Earth: **35 MPH**
  - If roadway does not have a posted speed limit, can assume 50 MPH.
  - Speed limit resolution information is available within the [DelDOT Gateway](#), which should be verified with the Google Street View information.
2. AADT - Information from the latest [DelDOT Gateway: 5,808 Trips](#) (From 2022 DelDOT Traffic Summary)
3. 10-Year Projected AADT = Current ADT x 10-Year Growth Factor. Apply the same 10-Year Growth Factor that is used in DelDOT's [Auxiliary Lane Worksheet](#). Currently the growth factor is 1.16. The most up-to-date worksheet is located within DelDOT's [Development Coordination Portal](#):  
 $10\text{-year AADT} = 5,808 \times 1.16 = \mathbf{6,737 \text{ Trips}}$
4. Traffic Pattern Group - Information from the [DelDOT Gateway: TPG – 2](#)
5. K-Factor, D-Factor, Truck Percentage – Information from the latest DelDOT [Traffic Volume Summary](#):  
**K-Factor = 10.9, D-Factor = 56.3, Combo Unit Truck % = 0.9 (From 2022 DelDOT Traffic Summary)**

- **Site Traffic Data:**

1. Trip generation is based on the latest edition of the ITE Trip Generation Manual. Procedure to determine if rates and/or equations are to be used to calculate the trip generation for the proposed development is based on the guidance provided in the latest ITE Trip Generation Handbook. Peak hour periods to include in the diagram is at DelDOT's discretion. In this specific example, only AM and PM values are represented.
  - i. 210 Multifamily Housing (Low-Rise) (ITE Land Use Code 220) - Use equation which results in **1,421 ADT (710 Enter/711 Exit), 88 AM Peak (21 Enter/67 Exit), 111 PM Peak (70 Enter/41 Exit)**
  - ii. 10,000 square feet Strip Retail Plaza (ITE Land Use Code 822) - Use equation for ADT and PM, use rate for AM, which results in **652 ADT (326 Enter/326 Exit), 24 AM Peak (14 Enter/10 Exit), 78 PM Peak (39 Enter/39 Exit)**
  - iii. 5,000 square feet Drive-In Bank (ITE Land Use Code 912) - Use rate which results in **502 ADT (251 Enter/251 Exit), 50 AM Peak (29 Enter/21 Exit), 105 PM Peak (52 Enter/53 Exit)**
2. Number of entrances and corresponding configurations: **Two Entrances – Full Movement**
3. Design Vehicle – Select a design vehicle that is likely to use the proposed development entrances with considerable frequency and is consistent with Figure 5.2.3-a from the Development Coordination Manual. **SU-30**
4. Total Site Traffic for Proposed Development - **2,575 ADT (1,287 Enter/1,288 Exit), 162 AM Peak (64 Enter/98 Exit), 294 PM Peak (161 Enter/133 Exit)**
5. Directional Distribution: If information specific to the site occupant is available, for example, the feeder pattern for a school site, that information should be used. More commonly, this distribution is based on engineering judgment which is based upon existing and /or future traffic patterns surrounding the development area. Details of determining peak hour volumes are located in the **Traffic Generation Diagram** section below.

In this case **75% to and from the west and 25% to and from the east.**

  - **75% to and from the west =  $2,575 \times 75\% = 1,931$  ADT (965 Enter/966 Exit), 122 AM Peak (48 Enter/74 Exit), 221 PM Peak (121 Enter/100 Exit)**
  - **25% to and from the east =  $2,575 \times 25\% = 644$  ADT (322 Enter/322 Exit), 40 AM Peak (16 Enter/24 Exit), 73 PM Peak (40 Enter/33 Exit)**
6. Percent of Peak Hour Heavy Vehicles at Site - Select a percentage that is consistent with the proposed development – **Peak Hour HV% of Proposed Site = 5%.**

• **Traffic Generation Diagram:**

1. Development generated trips should be assigned to the proposed entrances according to the actual development site plan as well as existing and/or future traffic patterns surrounding the development area.
2. For the purpose of this example, the directional distribution is 75% to and from the west and 25% to and from the east. In addition, since there are two entrances, the trips coming in and out of the development are assigned 70% for the first entrance passed and 30% for the second entrance passed. Note, the percentages utilized are assumed for this example and different percentages based on specific aspects of a development may be appropriate.

• **Site ADT Entering from the west**

$$\begin{aligned} \text{Entrance 1} &= \text{Entering Site ADT} \times \text{Directional Distribution} \times \% \text{ at 1}^{\text{st}} \text{ Entrance} \\ &= 1,287 \quad \times \quad 75\% \quad \times \quad 70\% \quad = 676 \\ \text{Entrance 2} &= \text{Entering Site ADT} \times \text{Directional Distribution} \times \% \text{ at 2}^{\text{nd}} \text{ Entrance} \\ &= 1,287 \quad \times \quad 75\% \quad \times \quad 30\% \quad = 290 \end{aligned}$$

• **Site ADT Exiting to travel west**

$$\begin{aligned} \text{Entrance 1} &= \text{Entering Site ADT} \times \text{Directional Distribution} \times \% \text{ at 1}^{\text{st}} \text{ Entrance} \\ &= 1,288 \quad \times \quad 75\% \quad \times \quad 70\% \quad = 676 \\ \text{Entrance 2} &= \text{Entering Site ADT} \times \text{Directional Distribution} \times \% \text{ at 2}^{\text{nd}} \text{ Entrance} \\ &= 1,288 \quad \times \quad 75\% \quad \times \quad 30\% \quad = 290 \end{aligned}$$

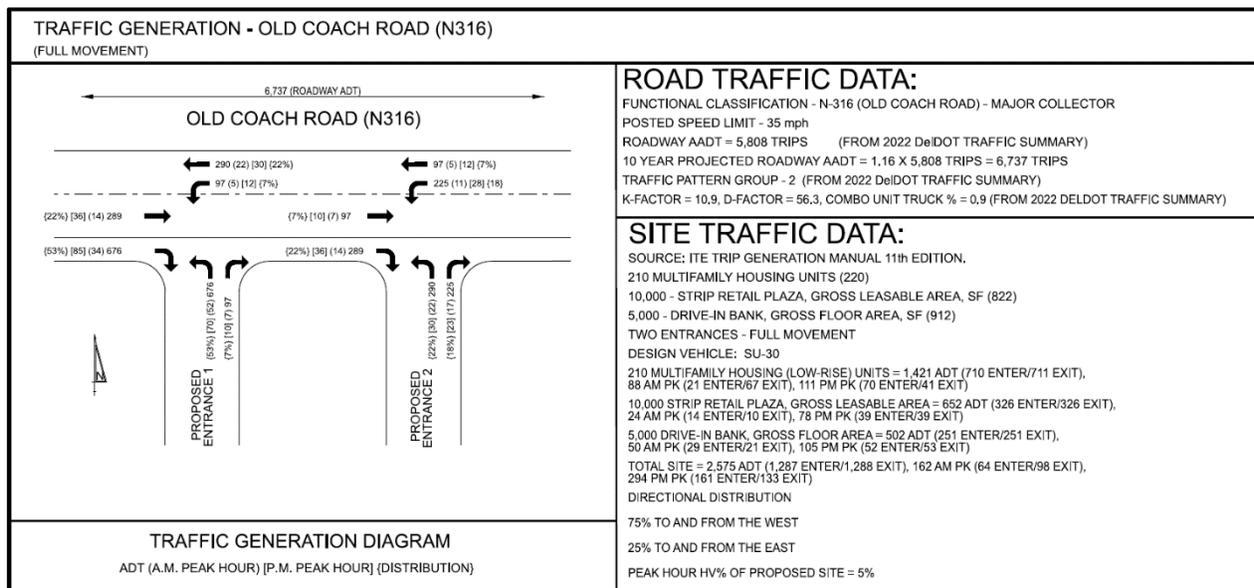
• **Site ADT Entering from the east**

$$\begin{aligned} \text{Entrance 1} &= \text{Entering Site ADT} \times \text{Directional Distribution} \times \% \text{ at 1}^{\text{st}} \text{ Entrance} \\ &= 1,287 \quad \times \quad 25\% \quad \times \quad 30\% \quad = 97 \\ \text{Entrance 2} &= \text{Entering Site ADT} \times \text{Directional Distribution} \times \% \text{ at 2}^{\text{nd}} \text{ Entrance} \\ &= 1,287 \quad \times \quad 25\% \quad \times \quad 70\% \quad = 225 \end{aligned}$$

• **Site ADT Exiting to travel east**

$$\begin{aligned} \text{Entrance 1} &= \text{Entering Site ADT} \times \text{Directional Distribution} \times \% \text{ at 1}^{\text{st}} \text{ Entrance} \\ &= 1,288 \quad \times \quad 25\% \quad \times \quad 30\% \quad = 97 \\ \text{Entrance 2} &= \text{Entering Site ADT} \times \text{Directional Distribution} \times \% \text{ at 2}^{\text{nd}} \text{ Entrance} \\ &= 1,288 \quad \times \quad 25\% \quad \times \quad 70\% \quad = 225 \end{aligned}$$

The same procedure should be done for the AM and PM peak hour site traffic.



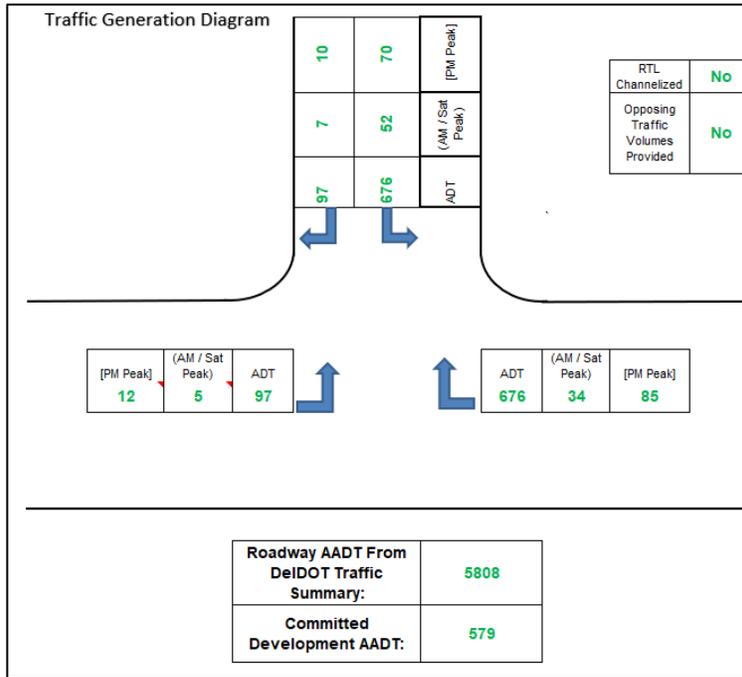
- **DelDOT Auxiliary Lane Worksheet**

Complete the worksheet per below:

1. Fill in the volumes on the **Traffic Generation Diagram** tab consistent with the Traffic Generation Diagram created for the Entrance Plan.
  - i. If the proposed entrance will create the fourth leg to an existing entrance, separate Auxiliary Lane Worksheets shall be completed and submitted for review of both the proposed entrance and the existing entrance.
  - ii. If the proposed entrance will create the fourth leg to an existing T intersection (2 roads), an Auxiliary Lane Worksheet shall be completed for the proposed entrance and all other approaches will need further evaluation per the Development Coordination Manual and associated state and federal manuals (i.e. AASHTO Green Book).
2. If the entrance is an existing access point, left turn and right turn ADT and peak hour volumes shall include site traffic and existing roadway traffic.
3. If opposing roadway traffic volumes were collected, include in the worksheet.
4. If the opposing right-turn movement is channelized, a reduction may be included in the worksheet. Justification for reduction shall be submitted to DelDOT Development Coordination Section for review.
5. If Committed Development traffic information is known, include in the worksheet. This information is commonly included in a Final TIS.
6. In the **User Inputs** tab, fill in the cells with green text.
  - i. If opposing roadway traffic volumes were collected and/or the opposing right- turn movement is channelized, the Left Turn VPH should be the same peak hour as the peak hour chosen for the opposing through and right turn volumes within the **Traffic Generation Diagram** tab.
7. To obtain further clarification on how ADT is determined per approach, see **Left-Right Approach Example** tab within the DelDOT Auxiliary Lane Worksheet.

# Creation of DeIDOT Auxiliary Lane Worksheet for Proposed Entrance 1

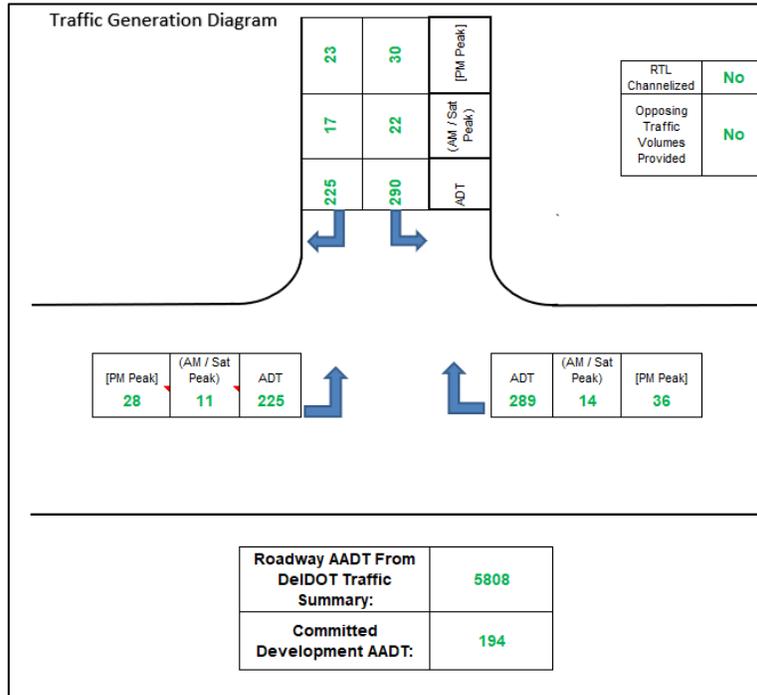
\*Committed Development AADT contains the site traffic to and from Proposed Entrance 2



DeIDOT Auxiliary Lane Worksheet										Manually Update Cell XX	
Roadway Information and Entrance										Auto-Calculated Cells XX	
Name of Project			Example - 2 Access			Date of Submittal			5/5/2023		
Maintenance Road No. (i.e. K234A)			N316			Road Name			Old Coach Road		
Signalized / Unsignalized			Unsignalized			Posted Speed Limit			35		
Roadway ADT (From DeIDOT Traffic Manual)			5808			Traffic Pattern Group			2		
Left Approach Site ADT	194	Committed Development ADT	579	Total Left Approach ADT	773	Right Approach Site ADT	1352	Committed Development ADT	579	Total Right Approach ADT	1931
Total Number of Through Lanes (Does Not Include Turn Lanes)			2 lanes			Number of intersection legs			3		
Roadway Functional Classification			Major Collector			Calculation for (specify leg)			Proposed Entrance 1		
Left-Approach Projected 10 yr Roadway ADT + Total Site + Committed Development ADT			7510			Right-Approach Projected 10 yr Roadway ADT + Total Site + Committed Development ADT			8668		
K Factor			10.9			D Factor			56.3		
<b>Left Turn Information</b>						<b>Right Turn Information</b>					
Left Turn VPH			12			Right Turn ADT			Over 400		
Left Turn Approach Grade			0.0%			Right Turn Approach Grade			0.0%		
Heavy Vehicle %			5			Effective Radius of Entrance			R<50'		
10 Yr Opposing Vol. (Manual Input - Veh/hr)			0			Right Turn Length			195 ft		
10 Yr Opposing Volume (Calculated)			413 Veh/hr								
10 Yr Opposing Volume (Calculated Vol.)			413 Veh/hr								
Bypass Lane Approach Taper			155 ft								
Bypass Lane Departure Taper			80 ft								
Bypass Lane Storage			75 ft								
NOTE:											

## Creation of DeIDOT Auxiliary Lane Worksheet for Proposed Entrance 2

\*Committed Development AADT contains the site traffic to and from Proposed Entrance 1



DeIDOT Auxiliary Lane Worksheet										Manually Update Cell	XX
Roadway Information and Entrance										Auto-Calculated Cells	XX
Name of Project		Example - 2 Access			Date of Submittal		5/5/2023				
Maintenance Road No. (i.e. K234A)		N316			Road Name		Old Coach Road				
Signalized / Unsignalized		Unsignalized			Posted Speed Limit		35				
Roadway ADT (From DeIDOT Traffic Manual)		5808			Traffic Pattern Group		2				
Left Approach Site ADT	450	Committed Development ADT	194	Total Left Approach ADT	644	Right Approach Site ADT	579	Committed Development ADT	194	Total Right Approach ADT	773
Total Number of Through Lanes (Does Not Include Turn Lanes)		2 lanes			Number of intersection legs		3				
Roadway Functional Classification		Major Collector			Calculation for (specify leg)		Proposed Entrance 2				
Left-Approach Projected 10 yr Roadway ADT + Total Site + Committed Development ADT		7381			Right-Approach Projected 10 yr Roadway ADT + Total Site + Committed Development ADT		7510				
K Factor		10.9			D Factor		56.3				
<b>Left Turn Information</b>					<b>Right Turn Information</b>					<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>Proposed Entrance 2</p> </div> <div style="text-align: center;"> <p>Proposed Entrance 2</p> </div> </div> <p style="text-align: center; font-weight: bold;">Example - 2 Access</p>	
Left Turn VPH		28			Right Turn ADT		201 - 300				
Left Turn Approach Grade		0.0%			Right Turn Approach Grade		0.0%				
Heavy Vehicle %		5			Effective Radius of Entrance		R<50'				
10 Yr Opposing Vol. (Manual Input - Veh/hr)		0			Right Turn Length		160 ft				
10 Yr Opposing Volume (Calculated)		413 Veh/hr									
10 Yr Opposing Volume (Calculated Vol.)		413 Veh/hr									
Left Turn Length		220 ft									